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CAN IMPROVING SOFT SKILLS INCREASING WOMEN'S EMPLOYMENT IN STEM?

Rolly Aruna Damayanti, Yayuk Yuliati, Siti Kholifah
Universitas Brawijaya, Indonesia
Email: rollyaruna2020@gmail.com, yayuk.yyl@gmail.com, ifah_sosio@ub.ac.id

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ABSTRACT

Employment in the Science, Technology, Engineering, and Mathematics (STEM) sector is associated with men's occupation. STEM is perceived to be more suitable for men mirroring the long-held gender stereotyping of occupations. With the growth in automation and digitalization, women have more opportunities to find jobs in the STEM sector. However, to avail of these opportunities, women need support to adapt to the changes in the job market by developing soft skills that can complement their technical competencies. The present research aims to investigate how soft skills training can help female STEM graduates in the transition from school to work. The study uses a qualitative approach with a descriptive phenomenological method. Data was collected through interviews and a literature review. The findings of this research demonstrate that soft skills training improved self-confidence and helped female graduates to prepare better for jobs in the STEM sector. The study argues additional program and support such as structured soft skills training needed to better prepare female students compete in STEM's employment. By doing so, the number of women who wish to study and pursue a career in the STEM sector can be increased. Soft skills training can improve work readiness and create a more level playing field for women in the STEM sector.

INTRODUCTION

With an increase in automation and digitalization fueling the Industrial Revolution 4.0, significant changes are expected in the job market and workplace in the future. The International Labor Organization (ILO) estimates that 56 percent of employment (over 60 million jobs) in Indonesia will be automated (ILO, 2018). This will no doubt result in job losses. Women in Indonesia are 20 percent more likely than men to lose their jobs due to automation (McKinsey&Company, 2019). More jobs will be lost in professions requiring repetitive tasks and those considered low-skill. Typically, more women are employed in low to medium-skilled occupations. Although some jobs will be lost forever, automation creates opportunities, including reprofiling tasks and new jobs for skilled workers. It is estimated that between 4 and 23 million new jobs will be created by 2030 (McKinsey&Company, 2019). The growth of high-skilled jobs presents an opportunity for more women to participate in the labor market and increase their share in high-skilled professions.

Many high-skilled jobs require education and skills in Science, Technology, Engineering, and Mathematics (STEM). In Indonesia, the number of students in STEM disciplines is very low. According to the Ministry of Women's Empowerment and Child Protection, in 2021, only 31.5 percent of Indonesians had undergraduate certificates in STEM-related fields, with men and females accounting for 33.9 percent and 29.4 percent, respectively (KemenPPA, 2021). The gap between men and women is even wider in the workplace, where only 2 out of 10 women are engaged as professionals and 3 out of 10 as scientists in STEM-related employment.[4]. Women face numerous challenges in accessing education and employment opportunities in Indonesia. Male dominance, discrimination, and gender stereotypes are some

of the factors that discourage women from studying and working in the STEM field (KemenPPA, 2021; Muhamad et al., 2021; Wahyuningtyas & Adi, 2021). The under-representation of women in STEM can be attributed to social norms and cultural bias preventing them from majoring in STEM or seeking employment in this field. The lack of workplace mentors and the male-dominated work culture discourage women from entering STEM sectors (Harding, 1999). Several studies confirm that women perceive occupations in STEM as more suitable for men. They usually lack the confidence to pursue work in STEM sectors. Women also tend to accept the notion that men have better intellectual abilities for STEM professions (Sainz et al., 2019; Swafford & Anderson, 2020; White & Massiha, 2016). A gender stereotype exists that men are better suited to study and employment in the STEM sector. Women are considered to be more suitable for studies in arts and humanities (Clark L et al., 2021; Davenport et al., 2022; Kerpen, 2017; Kizilay et al., 2020; Nguyen & Riegle-Crumb, 2021; White & Massiha, 2016). As a result, many women end up working in the services sector. Although research shows that girls have the same ability as boys in math and, in some cases, even outperform them, girls often have lower self-confidence in their abilities compared to boys (White & Massiha, 2016; Sainz et al., 2019; Sa'dan, 2019). Low self-esteem of women affects their interest in STEM (Kerpen, 2017; UNICEF, 2020).

Over the years, feminists have strongly advocated the right and access to education for girls and women. According to liberal feminists, education is a tool in the battle against discrimination and ignorance. Liberal feminists believe in the power of education as a means for social reform and recognize its importance in uplifting women. They consider education as one of the most critical factors in improving one's life chances, the key to equal opportunities, and the ladder for the advancement of women (G. Weiner, 1986). They also underline that women should have the right to quality education and training to equip them for jobs that Industrial Revolution 4.0 can create.

Studies have identified several challenges that contribute to the low representation of females in STEM in Indonesia. These include the general difficulty for young women to pursue higher education. Gender stereotyping in society about educational qualifications and occupations also constrains women. Several qualifications and jobs are perceived to be more suitable for men. More females with bachelor's degrees in STEM are from urban areas than rural areas. The main reason for the higher proportion is better education facilities in urban areas(UNESCO, 2015; KemenPPA, 2021). More adherence to cultural and societal norms in rural areas, where women are seen as homemakers rather than as the breadwinners for the family.

According to the World Bank, skills development can contribute to structural transformation and economic growth by enhancing employability and labor productivity and helping countries become more competitive. However, employers in several countries, including Indonesia, report that a lack of skilled workers is a major bottleneck for their operations, affecting their capacity to innovate (World Bank, 2021). With the changing job market, employers are not only looking for workers with the right technical competencies but also for workers with good personal attributes or soft skills. The Indonesian Employers' Association/APINDO says there is a stronger focus now on finding workers with the appropriate technical skills and the necessary personal attributes (ICEFE, 2021). As more low-skilled jobs will be lost due to automation, soft skills are becoming even more crucial because these skills are portable across different sectors and occupations, including in STEM (McKinsey&Company, 2019; OECD, 2021; Davenport et al., 2022; Villán-Vallejo et al., 2022).

The definition of soft skills varies according to sectors or employers (Matteson et al., 2016). Some define soft skills as life skills, core skills, transferable skills, and the 21st Century

skills (Joynes et al., 2019). Generally, soft skills refer to emotional intelligence, a concept introduced by Goleman in his book in 1998. Emotional Intelligence (EI) is defined as the ability to identify, assess, and control one's emotions, the emotions of others, and that of groups. Goleman's model focuses on EI as a wide array of key competencies for leadership. They are self-awareness, self-regulation, social skills, empathy, and motivation. Colburn categorized soft skills into two broad categories: interpersonal (i.e. skills between the self and others) and intrapersonal (i.e. skills within oneself). Interpersonal soft skills refer to one's core skills that propel the individual's ability to perform and fit into a specific job. These skills include listening, asking questions, working in teams, resolving conflicts, and showing empathy. Intrapersonal skills include self-awareness, proactiveness, goal setting, time management, perseverance, and self-management (Colburn, 2018).

Researchers have confirmed the importance of soft skills in improving work readiness for students in higher education (Deming, 2017a; Lie & Darmasetiawan, 2018; Majid et al., 2012; Suhartono & Machmuddah, 2020). In addition, several studies confirm the importance of soft skills in STEM fields and call for urgent action so that higher education institutions can better prepare students for the world of work (Isaev & Plotnikov, 2021; Karimia & Piña, 2021; Villán-Vallejo et al., 2022). The research suggests that education and training institutions must equip graduates with soft skills besides specialized knowledge to prepare them for employment. Evidence shows a positive correlation between soft skills training and employment prospects for graduates. In the long term, soft skills also help graduates find jobs and earn higher wages (Balcar, 2016; Deming, 2017b; Grimes et al., 2022; Lopus et al., 2019; Warda, 2020). Studies show that improving soft skills increases self-efficacy and life satisfaction among female students (Kolb, 2011). Female students felt better about themselves and faced fewer interpersonal and intrapersonal problems when they knew how to deal with these situations. Female students also reported reduced pressure, greater responsibility, and felt less stress. The soft skills training improved their teamwork, communication, leadership, time management, decision-making, and problem-solving ability (Nair & Fahimirad, 2019).

Previous research on soft skills has focused on the perception of students and employers. Research has also focused on measuring the change in knowledge and skills before and after receiving soft skills training. Such studies have focused on the immediate changes resulting from soft skills training. Some tracer studies have also been conducted that have looked into the relationship between soft skills and employment outcomes. However, these studies have examined soft skills as part of a broader set of skills, focusing mainly on technical competencies. Very little research has been conducted to see the impact of providing soft skills training to students, especially women studying STEM disciplines. Few studies have examined the experience of women seeking work in STEM sector after receiving soft skills training.

RESEARCH METHOD

The present study aims to address this gap and complement existing research. Specifically, it examines whether soft skills help women better prepare for STEM jobs. The study traces the long-term impact of a United States Agency for International Development/USAID Program that introduced a soft skills training module in selected Higher Education Institutions/HEIs. The program was piloted in West Java and Central Java, targeting five HEIs with STEM's field during the period of 2018. The respondents were graduates interviewed two years after participating in the soft skills training. The research documents the life experience of these graduates with a focus on their transition from school to work.

The research applied a qualitative phenomenological method. Phenomenology is a research approach for analyzing and describing a phenomenon experienced by a person without interpreting and abstracting it (Creswell, 2014). In the present research, a feminist approach

was used to understand the life experiences of female students in preparing for the labour market and whether developing soft skills facilitated their entry and helped them overcome challenges.

The research used both primary and secondary data. Primary data was collected through interviews with female STEM graduates who completed USAID's soft skills training program. The informants were purposively selected with the following criteria: i) female graduates from universities who participated in the USAID training program, ii) completed seven modules of soft skills training, iii) majored in one of the STEM disciplines, and graduated between 2019 and 2021. The key informants of this research were NO, NA, AN, NI, NS, RA, SD, MA, ND, EM, NR, FR who are currently working in Kendal, Indramayu, Sukabumi and greater Jakarta, Bekasi, Karawang and Tangerang. Individual interviews were conducted through Zoom and Google. A transcript of each interview was prepared and recorded. Each transcript of an interview was assigned and coded with the informants' identity, checked for accuracy, and analyzed. The responses were clustered into selected theme (Creswell, 2014). Meanwhile secondary data was collected using journal and articles which has similar topics with this research.

RESULTS AND DISCUSSION

A soft skills training module was developed and piloted through a technical cooperation programme between USAID and the Ministry of National Education in selected HEIs. Four participating HEIs were from peri-urban areas of West Java and Central Java, while one was located in provincial cities. The participating HEIs appointed their staff to participate in the Training of Trainers (TOTs). USAID experts delivered the TOTs for seven days and continued to provide coaching and mentoring for one year. The training included strengthening facilitation skills, reviewing soft skills learning plans, and delivering training in front of their peers (micro teaching). During these sessions, the trainees could self-assess and receive inputs from their peers and expert trainers. Trained trainers then delivered the soft skills training to students at their respective universities. With the help of the Career Development Center (CDCs) or Department of Students Affairs in HEIs, they offered training to students preparing to take part in apprenticeships and fieldwork or *Kuliah Kerja Nyata*/KKN. The trainers ensured that 40% of registered trainees were female students.

The soft skills module comprised strengthening intrapersonal skills, which include self-awareness, building self-confidence, time management, managing responsibilities, critical thinking, decision-making, and setting goals. The training also focused on interpersonal skills such as assertive communication and teamwork. It aimed to equip students with the knowledge and skills necessary to enter the workplace. The assumption was that better soft skills could improve their employability. The trainers used pre-and post-training assessments to i) measure changes in knowledge related to the topic, ii) and the satisfaction of trainees in the overall implementation of the training, support from the trainer, and the quality of the learning material. According to the final report of the USAID program, around 97 percent of the trainers who participated in the TOTs reported being fully satisfied with the training. About 95 percent of participants reported increased knowledge and skills in delivering soft skills training support to the students.

12 female graduates' students who participated in the USAID training between 2018-2020 agreed to participate in the present research and share their experiences. The interviews were conducted to find out their experiences after participating in the soft skills training and if it had helped them prepare for the labor market. The research targeted females who sought jobs in the STEM sector. Questions during the interview were framed in such a way as to examine whether soft skills training had enabled them to do anything different that may have increased

their chances of finding employment. The findings from these interviews were analyzed and broadly grouped into the following.

Self-Efficacy

According to Bandura, self-efficacy refers to an individual's belief about his or her ability to complete a given goal or task (Bandura, 1999). Furthermore, being self-efficacious shows an individual's ability to exercise a degree of control over events that affect his or her life. Moreover, according to Bandura, achieving a goal or tasks not only requires skills, but also the belief in oneself influences individual confidence and create motivation to do a task (Kolb, 2011). Majority of the students maintained this belief.

"It was very hot, but I needed to see what was happening up close." (NO, Major in Metal Casting, interviewed 12th November 2022).

Some jobs in STEM require employees to work on the factory floor, where conditions can be challenging, and for some jobs, women have to work mainly with men. People employed in foundry plants, for example, have to deal with an uncomfortable and physically challenging work environment. According to NO from Polytechnic A in Central Java, she was the only female when she did the internship. She knew she would be working in sweltering rooms in the factory where casting metal requires temperatures above 100 degrees Celsius.

Despite the discomfort, she was keen to see the casting process up close. She thought men might be physically stronger than women, but she noticed that not only her but also her male friends looked uncomfortable to stand too close to the area where the metal casting was done. NO explained that she maintained her distance with the heat but still able to pay attention on how the metal casting was done. She felt confident and never hesitated to communicate with other team members and the factory workers operating the metal casting process. She felt she was struggle in taking part in the metal casting process therefore she volunteered to be an active observer and a note-taker. She explained that this division of tasks were discussed with her male counterparts. After she graduated, NO was recruited by company who hosted her internship to manage the laboratory unit.

NA from the State Polytechnic B in West Java revealed that most of the workers in the mechanical engineering department where she did her internship for six months were men. Not only that, but she was also the only female in the neighborhood where the workers were housed. At first, she felt very awkward but soon settled down because some of the workers provided her assistance when she encountered difficulties. Moreover, her friends, all men from the same university participating in the internship, supported her and made her feel comfortable. NA said that she never hesitated to ask for help from her supervisors or fellow workers. Meanwhile, NR from University E in Central Java had different experience during her first week of internship in an Information Technology/IT department of her campus. The IT's department has 4 male staffs and 1 female admin assistant. At the beginning, when she encountered difficulties, she was not comfortable asking questions to her male counterparts and afraid to make mistakes. However eventually after few weeks she gain her confidence working with men as she was able to show her skills in IT.

AS, a student majoring in Information Communication Technology/ICT from the State Polytechnic B in West Java, who did her internship in an ICT company in Jakarta, often asked workers in these companies about their day-to-day work and the challenges they face. She needed to get fully familiar with the industry workplace because she wanted to work in the ICT sector. She asked them about the workload in the company, how one could specialize in coding, data analysis, and web designing, and about opportunities in the company. Having such knowledge beforehand helped AS to prepare better for the job interviews.

Effective Communication Skills

Interpersonal or social skills are learned behaviors used by individuals in interpersonal situations. Social skills, directly and indirectly, help individuals to adjust to societal standards and expectations in the norms prevailing in their surroundings. Social skills can be categorized into interaction with others, communication, and teamwork (Merrell & Gimpel, 1998). One of the modules in the soft skills training programmes focused on effective social communication. Effective Communication Skills cover an individual's ability to cope with interpersonal experiences, for instance, making friends, meeting people and joining groups. Reducing prejudice and promoting social relations (Boundaries, 2012).

Young female graduates usually feel insecure when interviewing for jobs and struggle to highlight their abilities. They find it difficult to respond appropriately during the interview. Even though some women gather information from social media about job interviews, they are generally not well prepared, and lack of confidence makes it even harder for jobs.

According to NA, AS, NO, NS, NR and RA, they felt male graduates' students have higher change to be recruited when looking for jobs in STEM's as men have higher confidence as these are the men occupations. Men do not need to prove to the recruitment team about their ability in technical skills. Meanwhile, women felt they had to prove they are as good as their male counterparts. According to the informants, one of the changes they attributed to the soft skills training was mental readiness during the job interview. As society looked down in women's ability in STEM's field, women must prepare for a job interview. They prepared ahead of time, carefully assessed their strengths and weaknesses, and articulated their long-term career goals in STEM. They could prepare better because they had practised "*elevator pitch*" techniques during the training. An elevator pitch training exercise helps the participants introduce themselves confidently in a minute.

"I remember working on the strengths, weaknesses, opportunities, and threats during the soft skills training. I liked the elevator pitching practice when we had to present ourselves to a new person within a minute. These two exercises helped me to prepare for the job interview." (NS, Major in Mechanical Engineering Production and Maintenance, interviewed on 12 Nov 2022).

Young women in universities in the periphery locations often lack information about job opportunities. Usually, CDCs do not exist in these universities, and students are left on their own to seek career guidance. Interaction with seniors and friends is crucial for fresh graduates to find job information. Furthermore, when the job interview takes place outside their hometown, young females are usually nervous. Proactively looking for job opportunities and getting familiar with companies and places outside their hometowns can help them search for jobs and interviews.

One of the informants, NA who graduated in 2021 obtained a diploma in cooling and air conditioning technical engineering from State Polytechnic A in West Java. NA explained that she was actively looking for a job after the internship. She contacted her seniors working in the company where she did her internship. She also registered in headhunting human resource companies, attended career expos, and actively searched for job-related information in social media and newspapers.

"In our Polytechnic, there is not much information about job opportunities. They do not have regular career expos. Thus, my friends and I were looking for information from career expos organized by the leading universities in Indonesia. It was not easy to find jobs. I got my first job after attending one of such career expos. And this was after several months of searching for a job." (NA, Interviewed on 12 Oct 2022).

Personal and Social Competence

Personal competence are a person's ability to recognize his or her abilities, manage emotions and deal with and respond to problems. Knowing their abilities, people can understand their strengths and weaknesses and take steps to address their weaknesses (Merrell & Gimpel, 1998). Meanwhile, social competence is defined as the ability to handle social interactions effectively. In other words, social competence refers to getting along well with others, being able to form and maintain close relationships, and responding in adaptive ways in social settings (I. B. Weiner & Craighead, 2010).

Research has shown that there is a relationship between these two competences with achievement in life (Nair & Fahimirad, 2019). Individuals learn about communication skills, critical thinking through self-management, and problem-solving through soft skills or life skills program. In this regards, majority of the informants has shown they have better positive attitude towards their ability to solve problems, making decisions about their future career in STEM's field and managing their confidence towards working in a male dominated employment.

AS, one of the informants, when she started working in Jakarta, she was afraid to live in a big city but keen to get out of her hometown. She searched for information and sought advice from senior graduates from her university working in Jakarta. She also got information from them about safe boarding houses for women easily accessible by public transportation.

Another informant, NA, demonstrated her ability to adapt and be flexible. After accepting a job at a foundation engaged in alternative energy, NA was surprised by the remoteness of the project site. However, she felt that she could adapt and took this assignment as part of her learning experience in the growing field of renewable energy. The ability to face and respond to a problem is also a key attribute that employers consider essential.

Employment in the STEM sector is concentrated in industrial zones where most companies are located. Generally, these industrial zones are close to a few large cities. Young women who study in smaller universities in the regions often have to travel outside their hometowns for employment. After receiving confirmation of a job offer, NA had to request her father's permission to work in Jakarta- the capital city of Indonesia. Although these days, women have the freedom to make their decisions, but often it is not always a free choice.

The family often influences women to discourage them from taking jobs outside their hometown or jobs that require them to work outdoors. All informants confirmed they asked their parents when they applied for jobs outside their hometown. Surprisingly only few parents encouraged them to find jobs in their hometown. In a case of NS, her parents encouraged her to stay in her hometown as she has not fully recovered from her motorbike accident which affected her mobility. After NS graduates from engineering bachelor's degrees, she applied different jobs related to mechanical engineering which most of the companies were located outside of her hometown. She obtained a job in a garment factory as a mechanical engineer but after 5 months she resigned due to her physical condition.

"I had an accident a day before my graduation which impacted my movement. I could not walk waster and lift heavy stuffs. Although my job did not require lifting heavy equipment, but I had to walk from one site to another site up and down. Then I realized that my physical condition had changed after the accident." (NS, interviewed 12th November 2022).

Meanwhile, MA decided to apply any jobs related to STEM even if the requirement is men only. She thought her hard work to study in engineering major in the state polytechnic should allow her to obtain "masculine" type jobs too. Her technical academic achievement has been proven to be as good as men and that should not limit her to apply only for "feminine" jobs. In a patriarchal society, employment is typically segregated into masculine and feminine jobs. Women work in occupations related to nurturing and interaction with others, emphasizing social skills. Men dominate professions associated with logical reasoning, math, and engineering (Kinanti et al., 2021). Majority of informants applied jobs that were men only as

long as the technical requirements match with their degrees. Women who went through the program has a grit quality which referred to women's persistence in pursuing their life goals and never give up despites' challenges. This confirmed the result from (Jagannathan et al., 2020) which students participated in the bridge to employment program had a positive impact on persistence in pursuing a task/goal (grit).

All the female graduates who took part in this study sought input from others and weighed their options carefully. They took their time and did not rush to make decisions. They carefully assessed different possibilities and did their cost-benefit analysis before accepting a job. According to AS, before she took a job in an ICT company in Jakarta, she sought all the necessary information about salaries and living costs in Jakarta. Proactively, she contacted some employees in the same industry and asked for their advice. She asked them about monthly rents in and around areas near the company, transportation, and living expenses. With this information, she was able to decide whether she should move to Jakarta or not. Also, having carefully considered all this information, she could negotiate her salary during the interview. During the interviews, NA and RA also collected information on living expenditures beforehand and then were able to negotiate their wages with the employers better. The informants referring to the decision-making process they learned from the soft skills training which helped them to critically assess their options when they must make decisions. Decision-making relates to collecting data and considering the options. Society, in general, perceives that women cannot make decisions logically. Decision-making is a skill every man and woman can hone it. Providing necessary support for women majoring in STEM is crucial to assist women can make decisions about choices in life. This is in accordance with the results of research (Blaique et al., 2022) which shows that mentoring can positively affect women's commitment to work in STEM fields.

These cases clearly illustrate the ability of female graduates to collect data and consider options in a very structured and logical manner. The soft skills training had prepared them to seek information, collaborate with others, and engage in active listening, which helped them in decision-making.

CONCLUSION

The research highlights the barriers women face in studying and finding work in the STEM sectors. Lack of confidence, limited information, career counselling support, nce, and social pressures are some of the barriers that women face and that discourage them from studying and working in the STEM sectors. The research qualitatively describes how soft skills benefited women to build self-confidence, interact with others, and help them solve problems. These learned attributes allowed them to compete for jobs in STEM sectors that Indonesian society perceives as "masculine."

The experience of the respondents clearly demonstrates that women can do jobs typically considered masculine in Indonesia. Developing soft skills can aid female graduates in competing for employment on a more even footing with their male counterparts. The research confirms that female students perceive the subject domain for STEM as gender-neutral. There is a need to emphasize the life experiences and interests of everyone by being gender aware in family relations and educational practices. This approach also supports the view of liberal feminism that calls for removing barriers that prevent equal access to women. Given the opportunity and provided the necessary support, such as developing personal attributes through soft skills training can encourage more women to pursue study and work in STEM. There is also the need to change the masculine work environment in STEM industries. Creating a safe and conducive work environment where workers from both sexes are not discriminated, or there are no prejudices based on their sex is critical for increasing women's employment in the

STEM sector. Lastly, it is important to note that the present research to explore the relationship between soft skills and entry into the labor market targeted only women who had a STEM qualification and also sought work in the same field. Future research can focus on women STEM graduates but who do not work in the STEM sector.

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